

18.5

THE PROGRESS OF CHEMICAL REACTIONS

Section Review

Objectives

- Describe the general relationship between the value of the specific rate constant, k , and the speed of a chemical reaction
- Interpret the hills and valleys in a reaction progress curve

Vocabulary

- rate law
- specific rate constant
- first-order reaction
- elementary reaction
- reaction mechanism
- intermediate

Key Equation

- $\text{rate} = k[A]^a[B]^b$

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

- The 1 of a reaction is dependent in part on the 2 of the reactants. An equation that relates reaction rate to reactant concentration is called a 3. In a rate law equation, k is known as the 4.
- The power to which a reaction concentration is raised is called the 5 of the reaction in that reactant. A reaction whose rate is directly proportional to the concentration of one reactant is called a 6 reaction. A reaction that is first order for each of two reactants is 7 overall. The actual order of a reaction is determined by 8.

- A single-step reaction is called an 9. A series of elementary reactions combine to form the 10 of a complex reaction.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 11. The rate order of a reaction can be determined from the balanced equation.
- _____ 12. There is at least one intermediate product in a chemical reaction.
- _____ 13. There is at least one activated complex in a chemical reaction.
- _____ 14. An elementary reaction is a one-step reaction.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 15. rate law
- _____ 16. specific rate constant
- _____ 17. first-order reaction
- _____ 18. elementary reaction
- _____ 19. reaction mechanism
- _____ 20. intermediate

Column B

- a. a single-step reaction
- b. reaction in which the rate is directly proportional to the concentration of one reactant
- c. a product of a reaction that becomes a reactant in another step of the reaction
- d. expression relating the rate of a reaction to the concentration of the reactants
- e. series of elementary reactions that take place during a complex reaction
- f. proportionality constant relating the concentrations of reactants to the reaction rate

Part D Question

Answer the following question in the space provided.

21. Below is the reaction progress curve for a complex reaction. Describe the reaction represented by the curve (number of steps and the significance of points A, B, C, and D).


